Vehicle Routing Optimization

SAS Optimization

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Background

What is Operations Research?

Finding the optimal solution to challenging decision problems with complicated constraints or parameters

- Optimal: minimize cost, maximize revenue, minimize time, etc.
- Challenging Decisions: many related decisions, each more complex than the previous
- Constraints & Parameters: finite time, finite human resources, limited technology or computing power

If you deal with...

Limited resources

A widening array of available actions

Diverse customers' needs and expectations

Government regulations

Changing business requirements or competition

...then you should care about optimization!

SAS Optimization

Key Capabilities

Time to Value

- SAS embeds all the analytical steps from descriptive to prescriptive, significantly reducing time to value.

Computational Speed

- Faster decisions at scale with SAS multithreaded and distributed computation.

Powerful Solvers

- Access to LP, MILP, QP, conic, NLP, CLP, network, and black-box solvers.

Open-Source Integration

- Easily accessible to open-source users with sasoptpy package.

Flexibility

- Support for creation and use of custom algorithms. Can even embed machine learning models in the optimization model syntax

Customer Support

- All the support you need with access to training courses, practical examples, and SAS Center of Excellence team of PhD level optimization experts.

Applications Across Industries

Some of the many ways we've helped our customers...

Banking	Government	Health & Life Science	Manufacturing & Energy	Comms & Retail
				
ATM Replenishment	Water Management	Chemical Mixture Optimization	Supply Chain Optimization	TV Advertising Optimization
Investment Portfolio Optimization	Price Optimization for Railroad	Medical Resource Optimization	Inventory Planning	Price and Inventory Optimization
Optimal Loan Assignment	Vehicle Routing	Hospital Room Assignment Simulation	Avoiding Downtime in Production Line	SKU Profitability

Vehicle Routing Optimization

Use Case Overview

- Healthcare organizations serving patients away from brick-and-mortar providers
- Vehicles with medical equipment, sometimes specialized, i.e. audiology, ophthalmology, radiology

Where are we going to deploy the vehicles to best serve patients?

Vehicle Routing Optimization

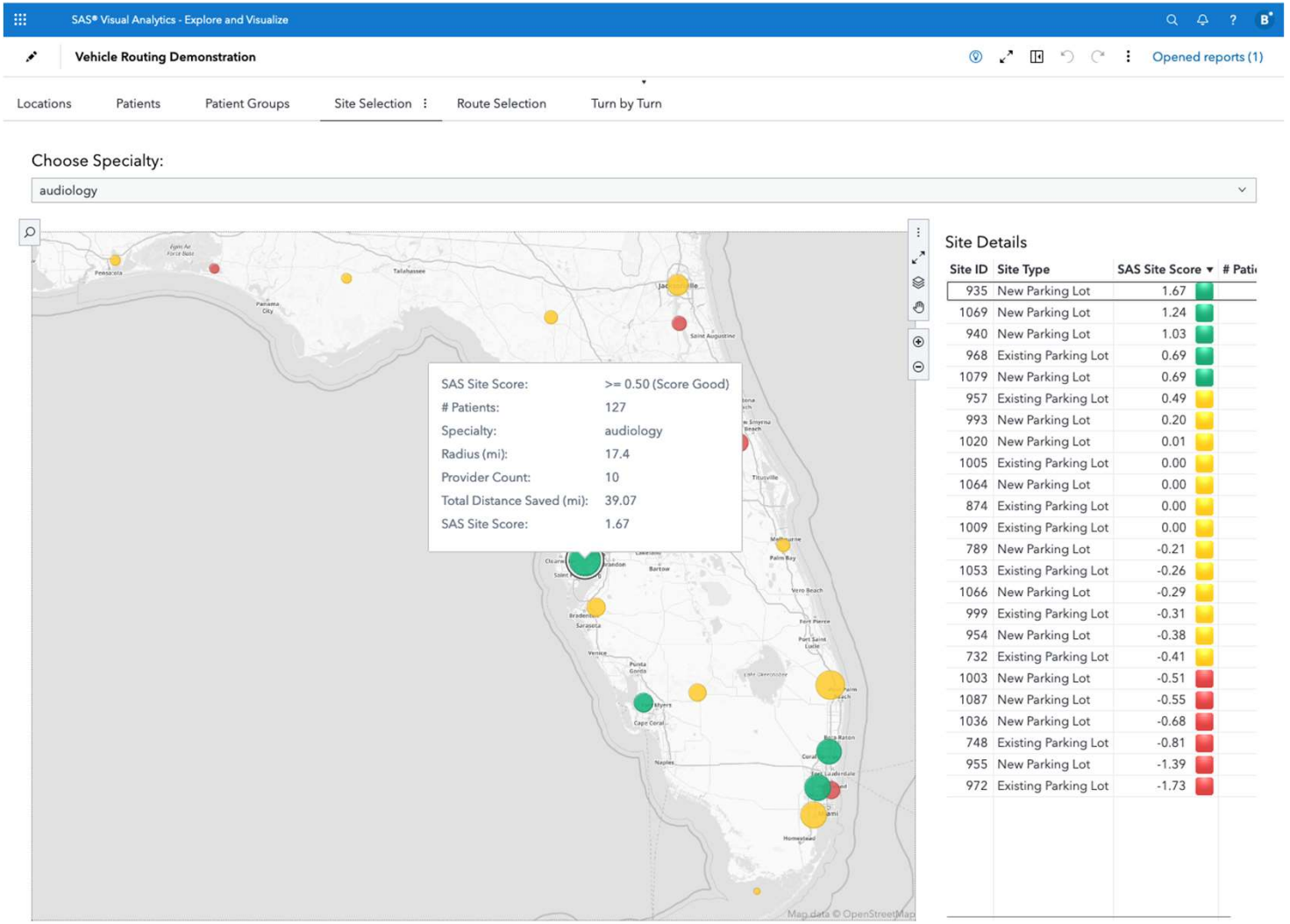
Process Modernization & Optimization

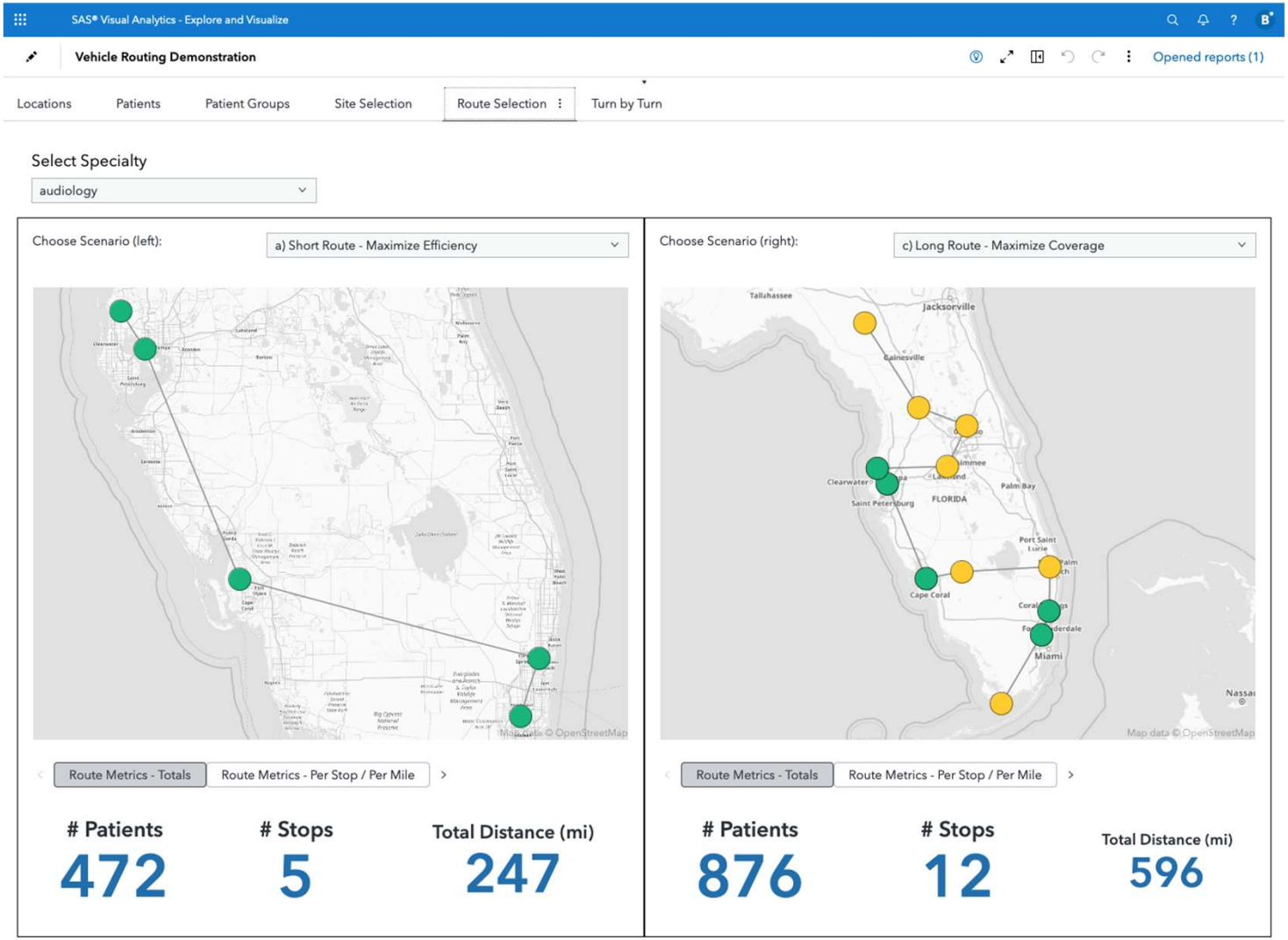
- Current processes are often:
  - manual
  - partially data driven
  - not standardized
  - complicated but not comprehensive
  - include some incomplete or partial data analysis and visualization
  - disconnected from related business operations, such as vehicle maintenance
- Process Modernization & Optimization includes:
  - automate data processing tasks
  - identify, score, prioritize site candidates
  - select groups of sites as routes by KPI
  - compare route options and refine routing criteria based on subject matter expertise
  - prepare optimal turn by turn routing

Vehicle Routing Optimization

Key Steps and Solution Techniques

Key Process Steps	Solution Techniques
Patient Classification – specialty, location	Network Community Detection
Comparison of Patients to Providers – availability, proximity	Geolocation
Vehicle Equipment Availability – location, suitable specialty equipment, maintenance	Proactive / Predictive Vehicle Maintenance Internet of Things (IoT)
Site Selection – quantity and density of patients – travel saved for patients relative to closest provider	Business based heuristics codified as optimization problems
Vehicle Routing Site to Site – order of stops, driving directions	Vehicle Routing Problem Turn By Turn Directions

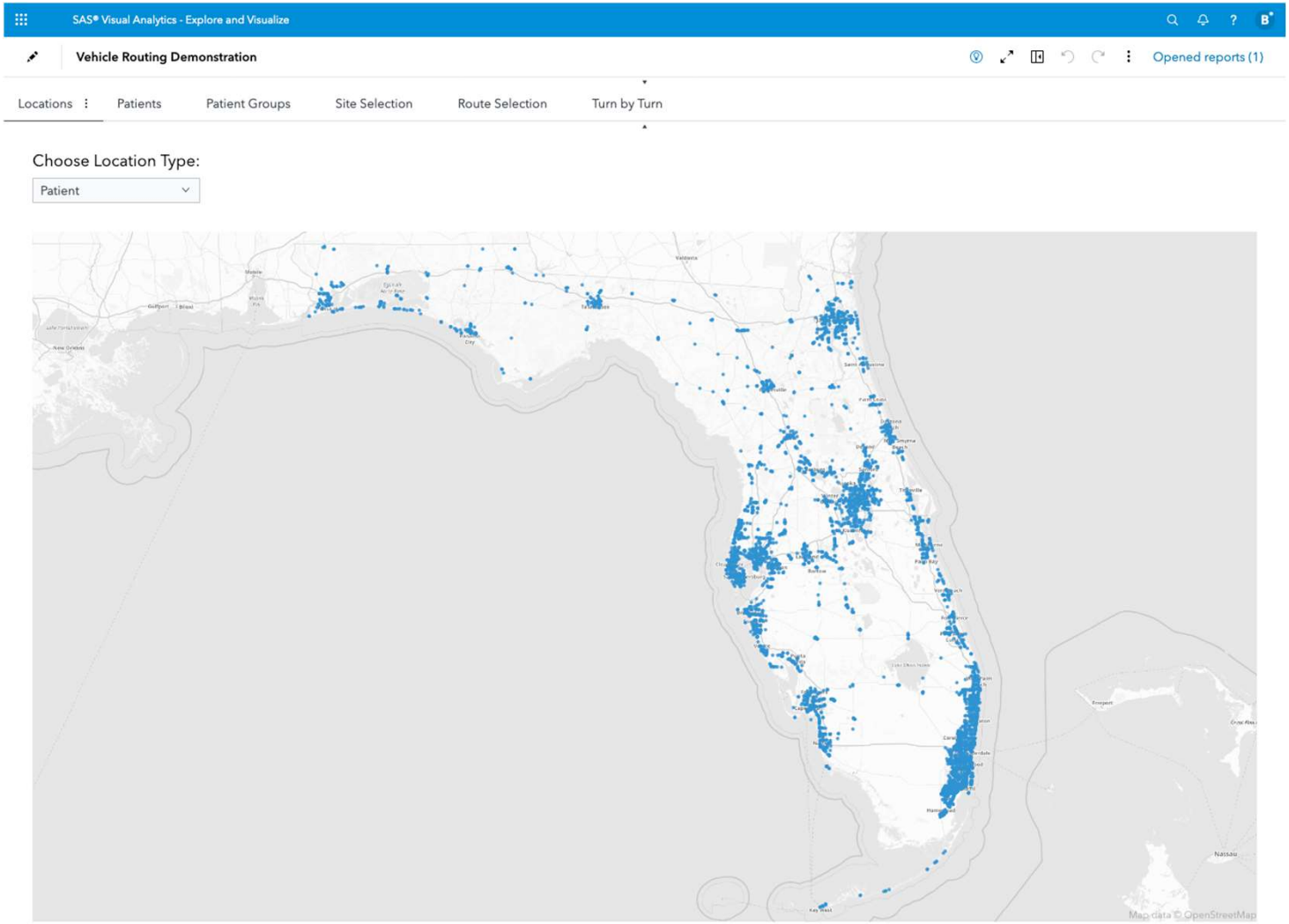


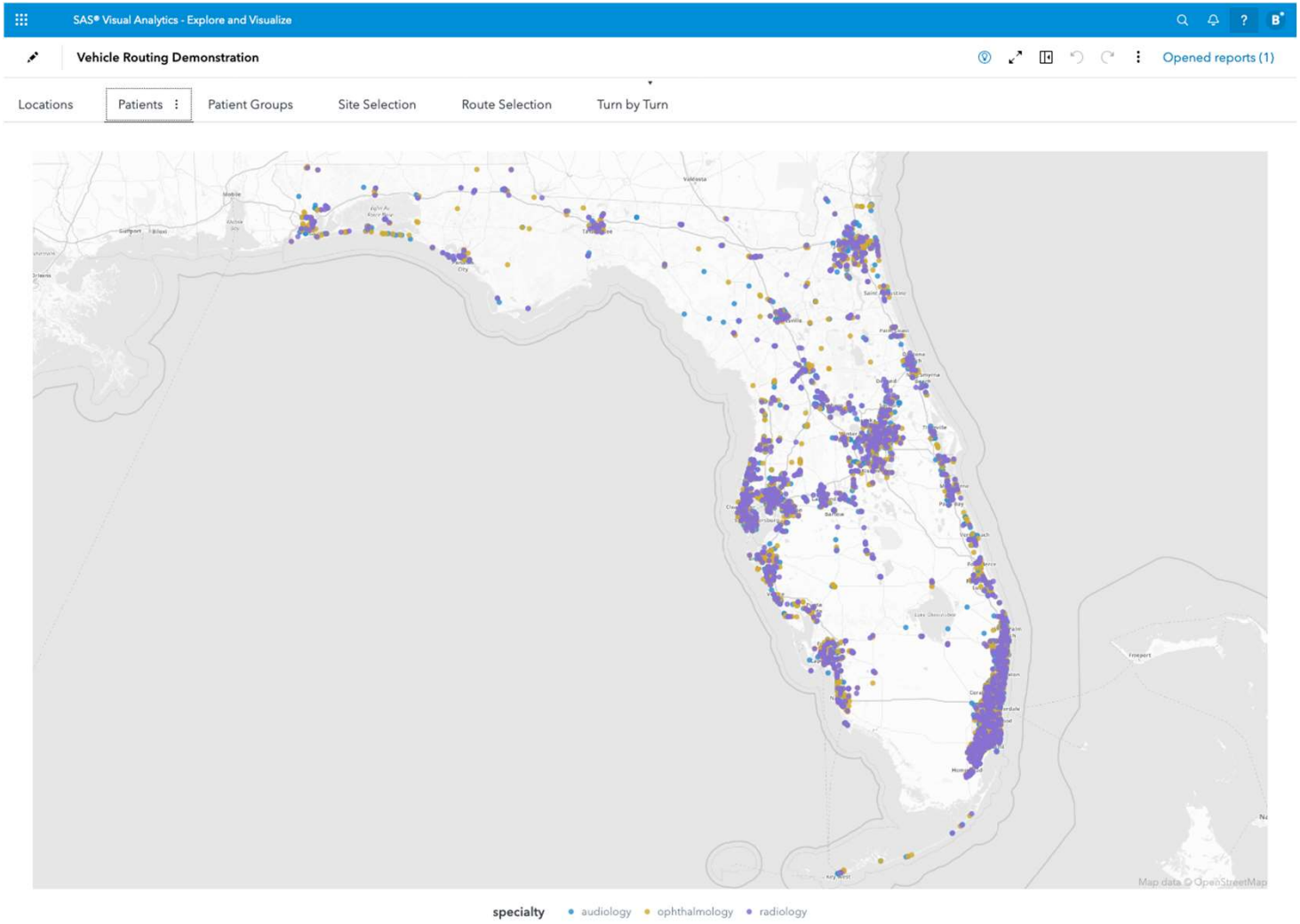


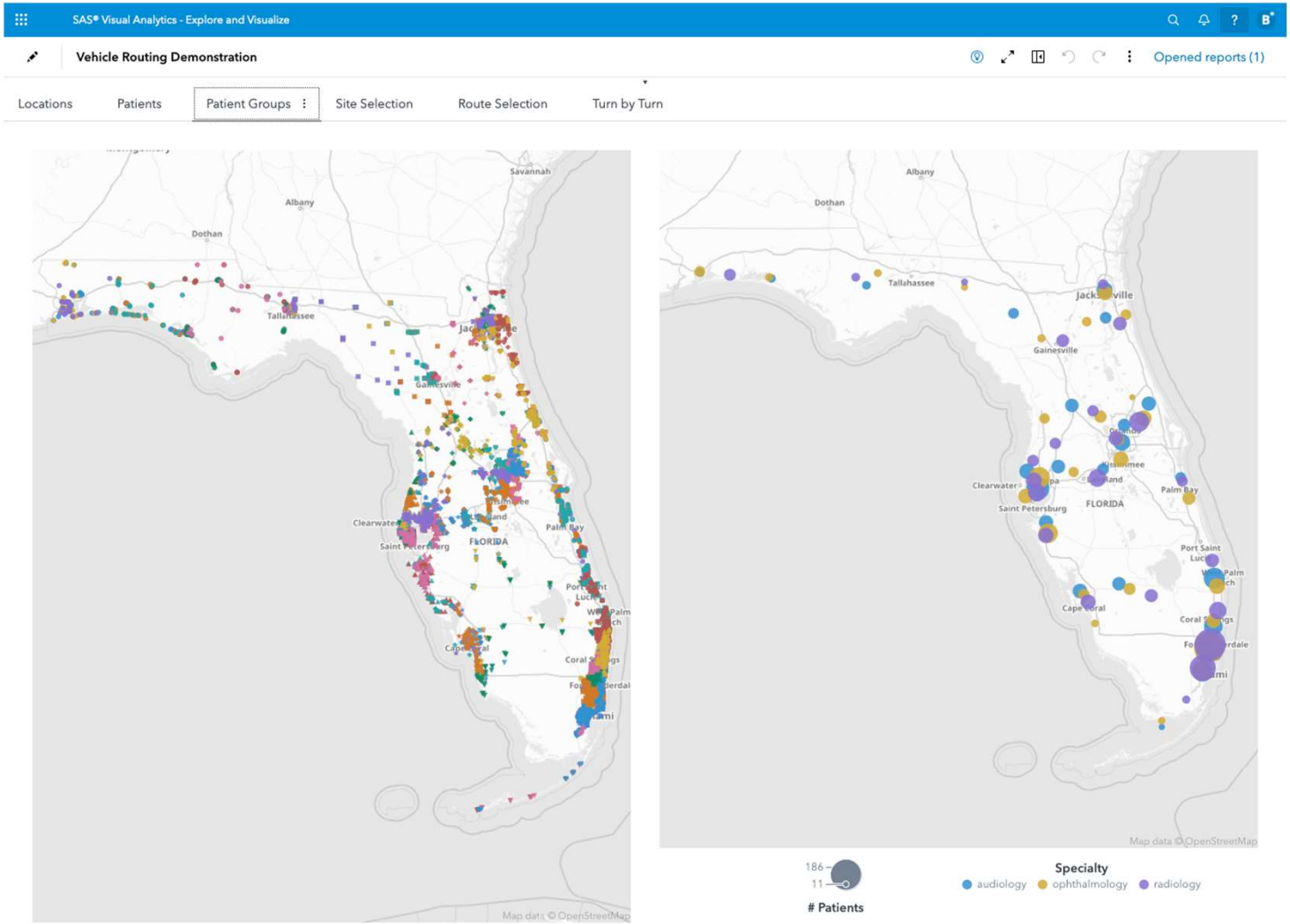
DEMO!

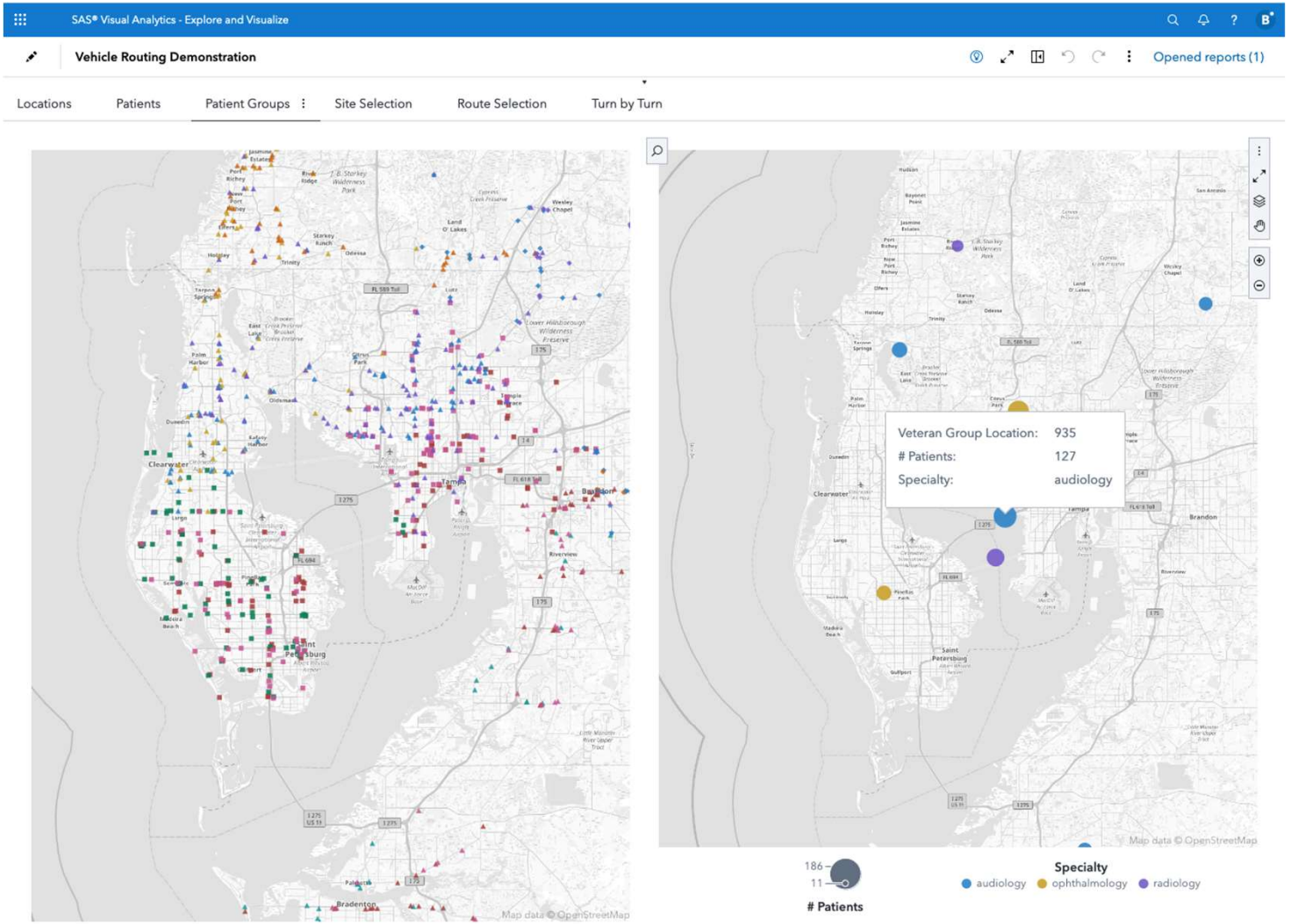
Appendix

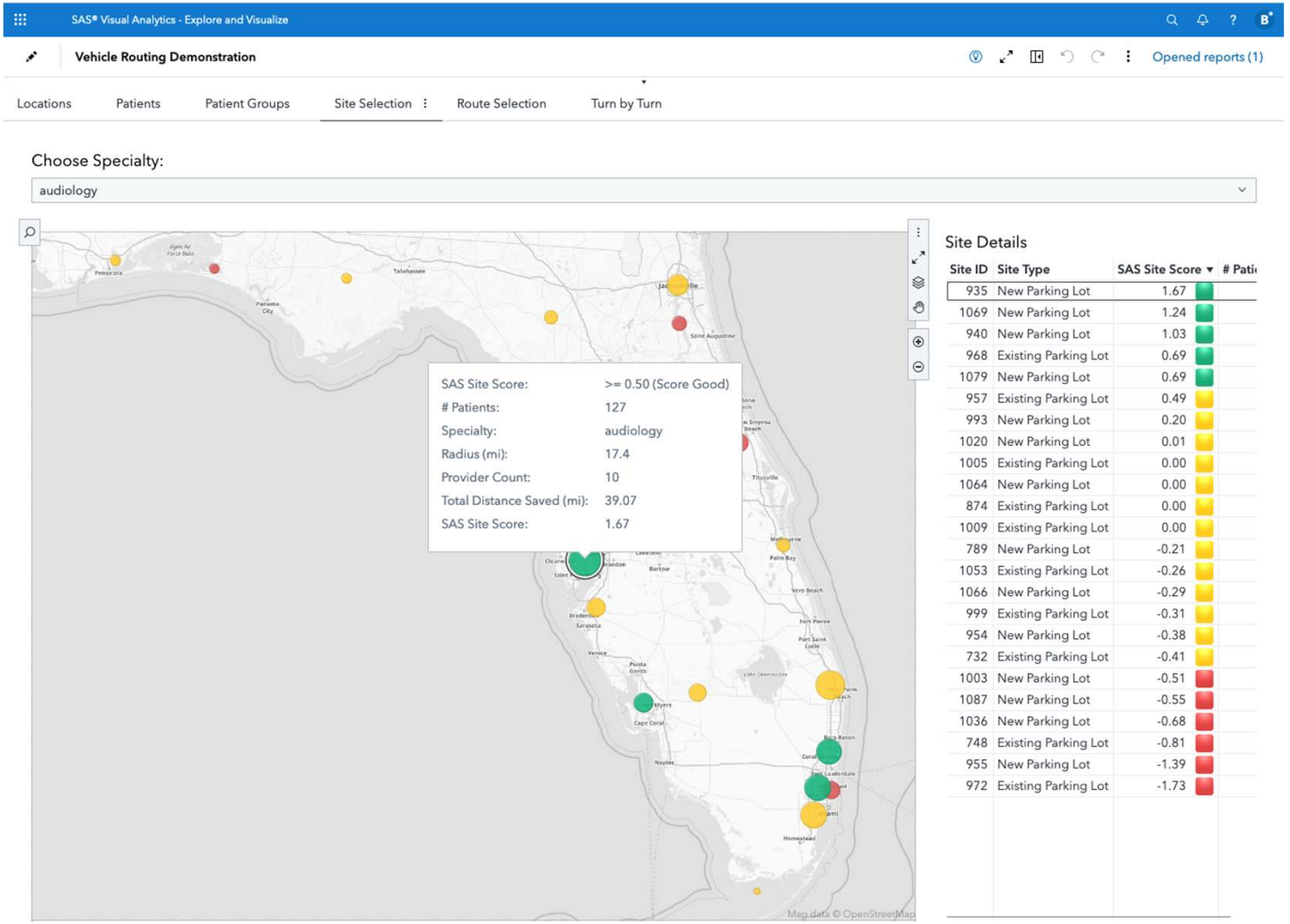
Screenshots of the Demo

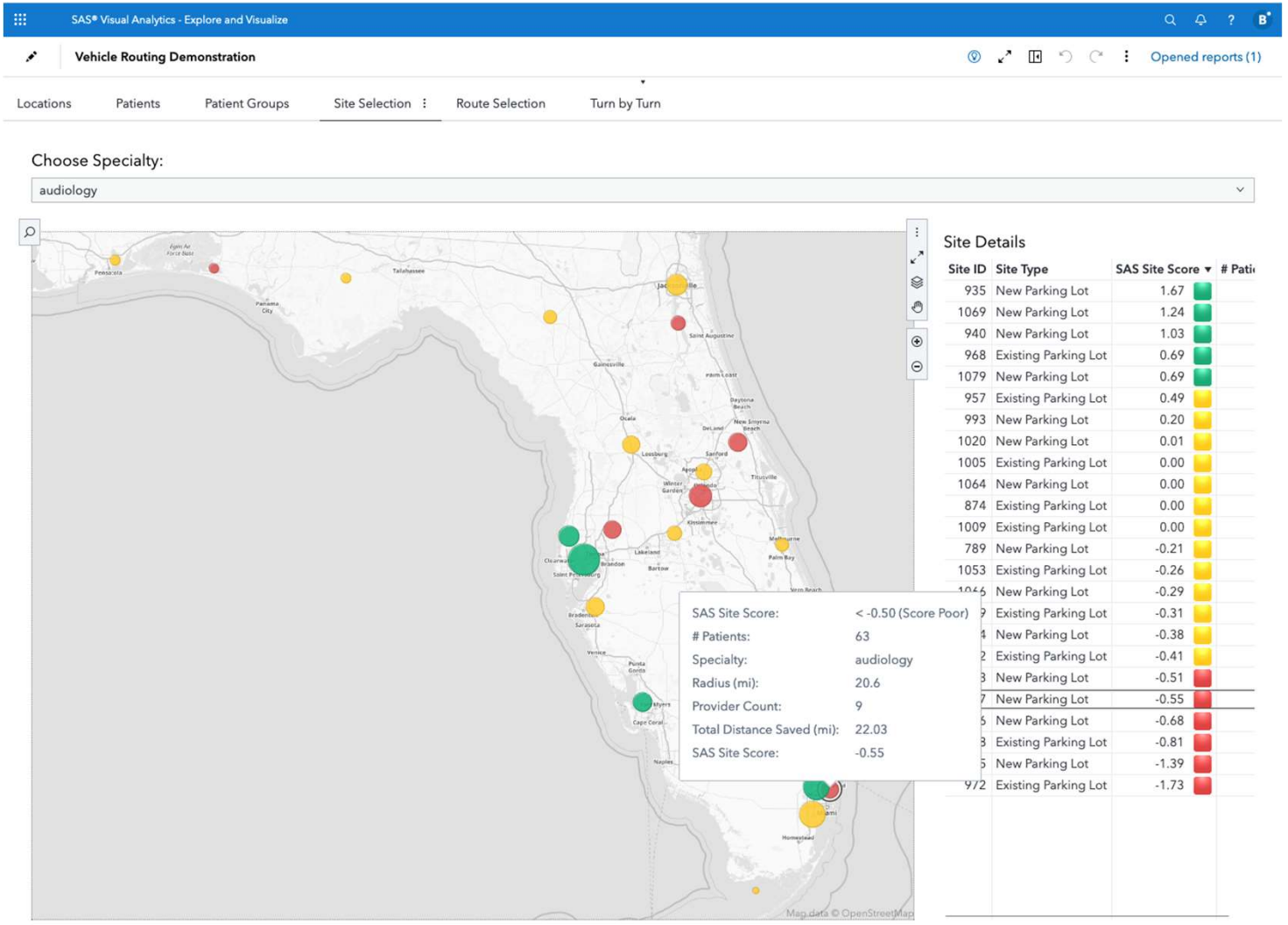


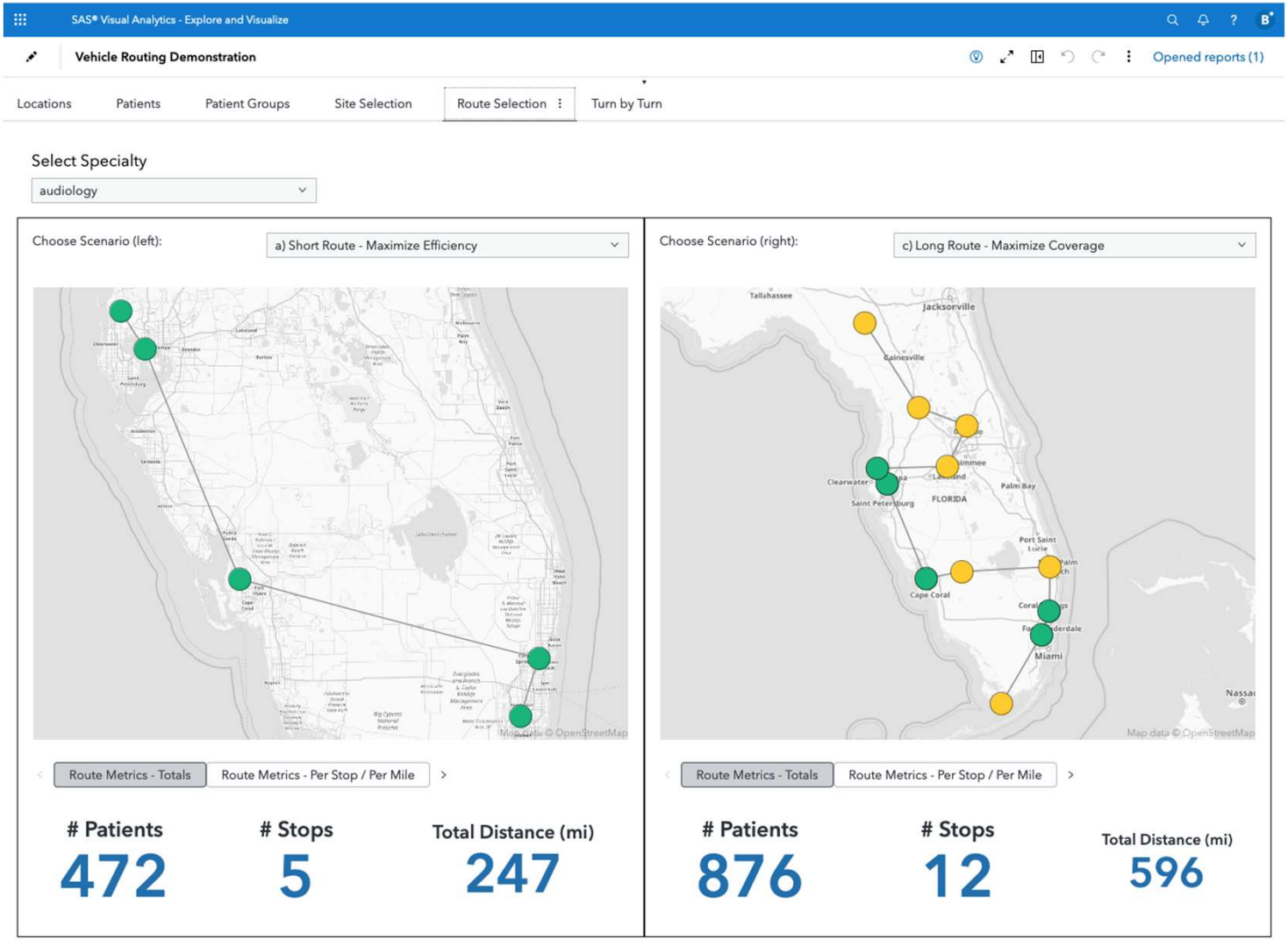


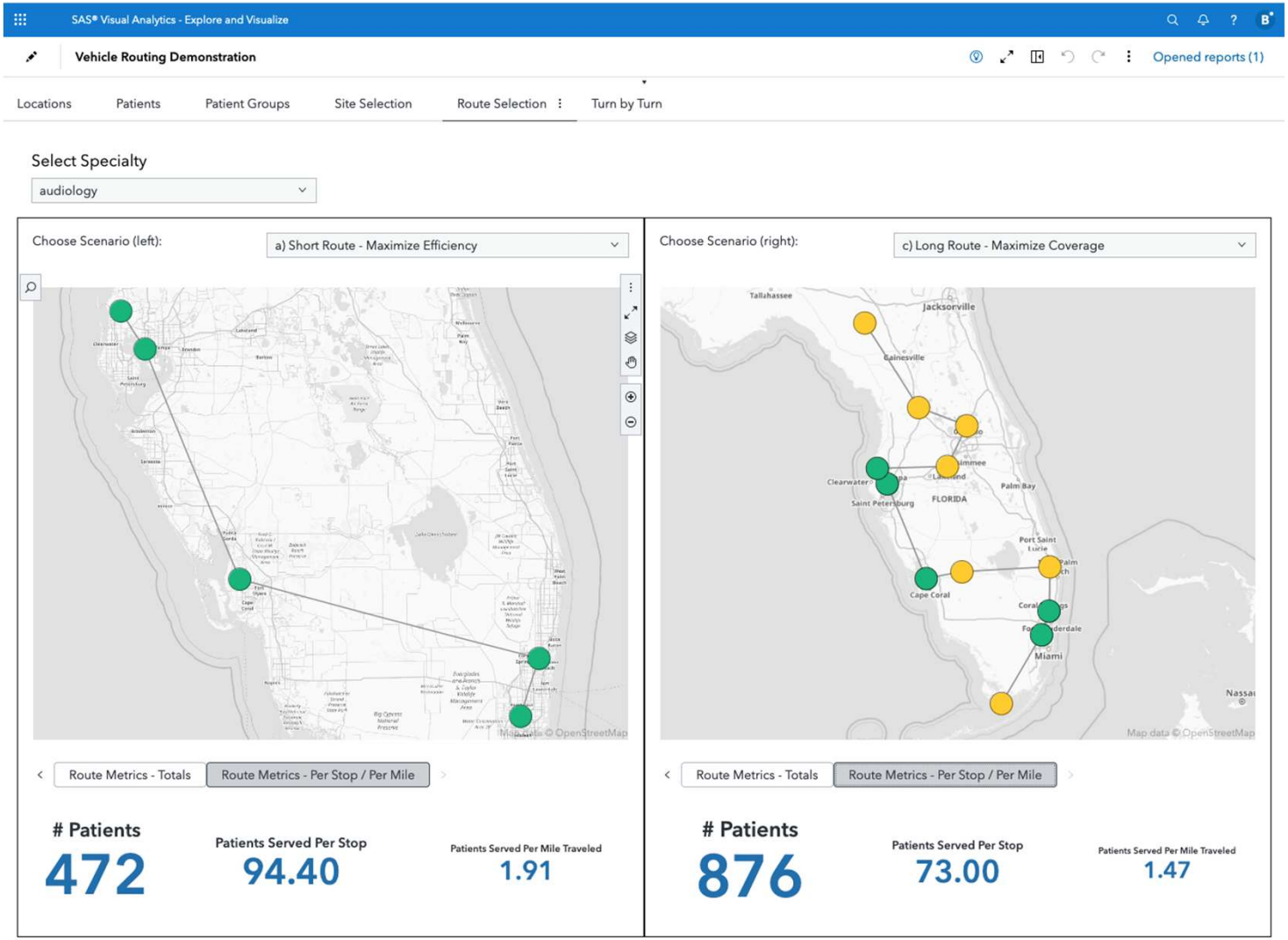


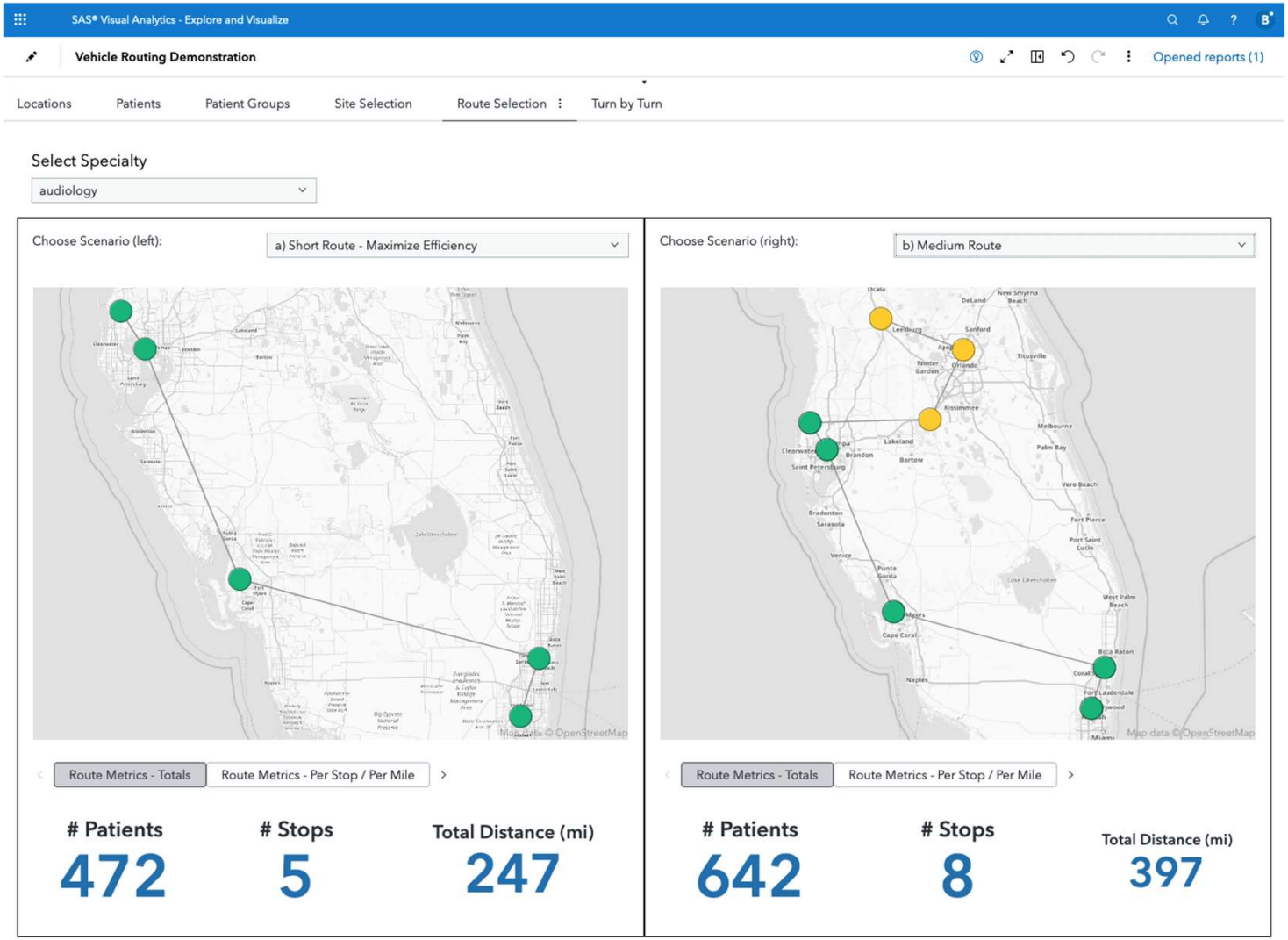


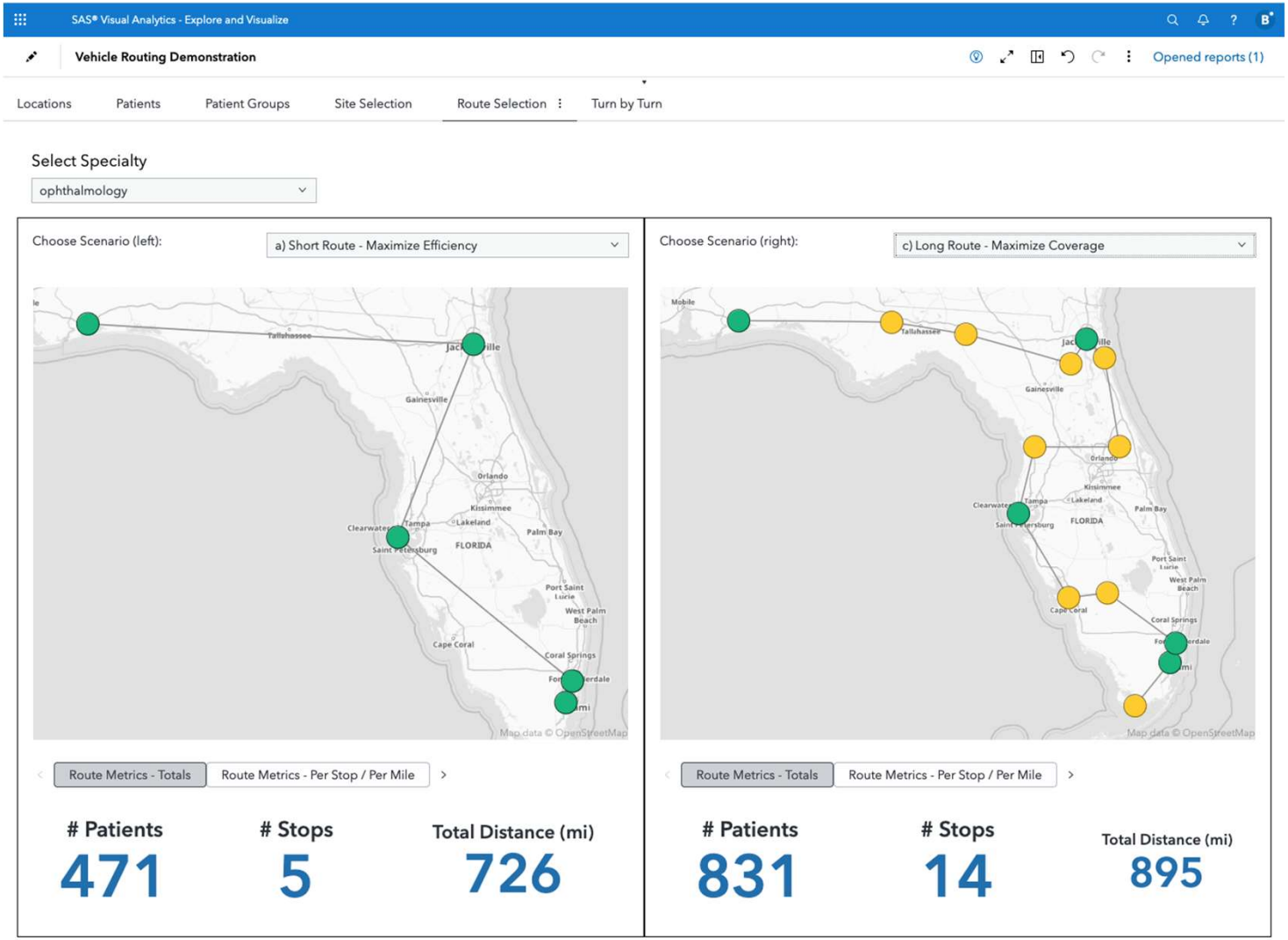


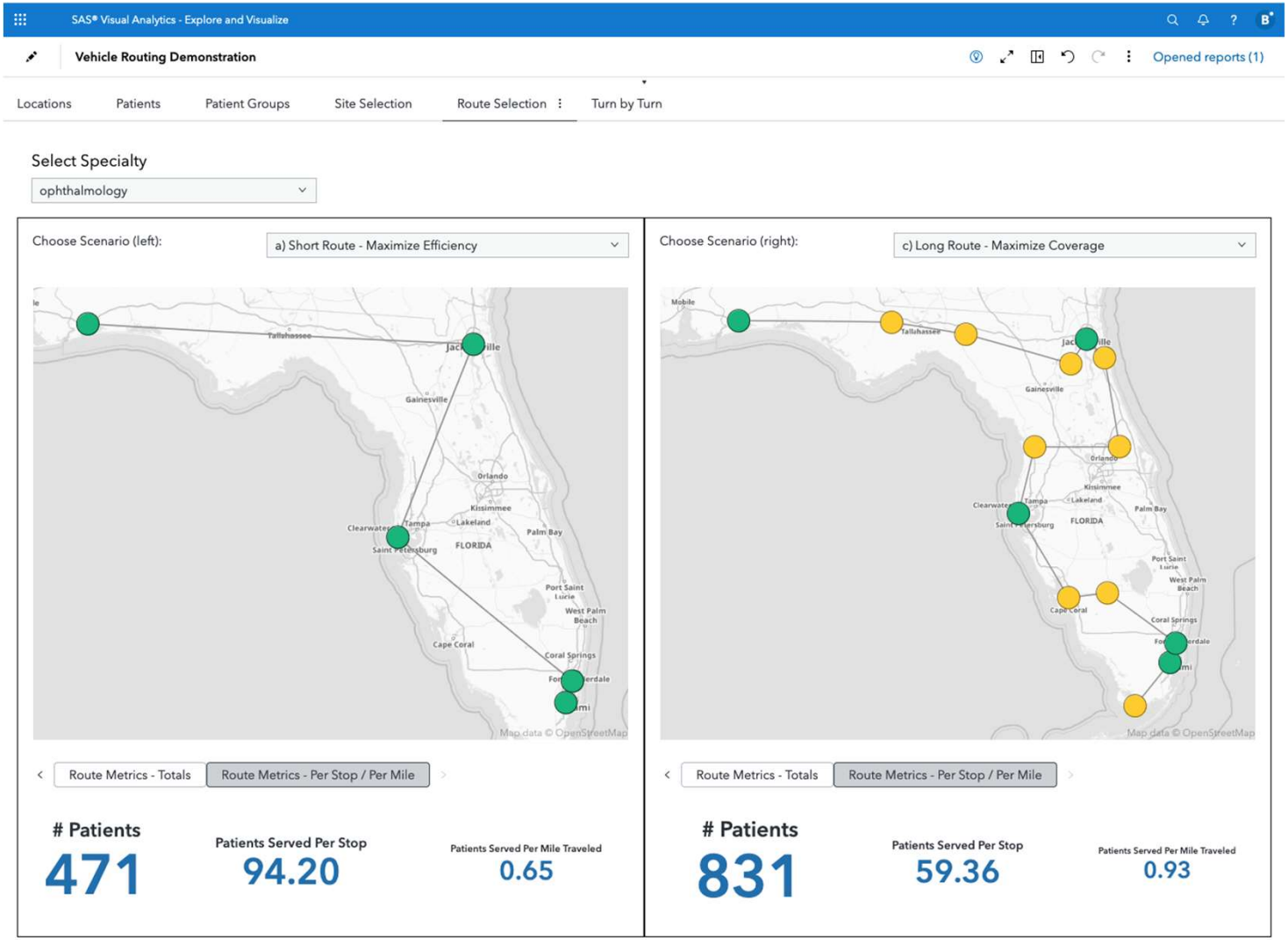


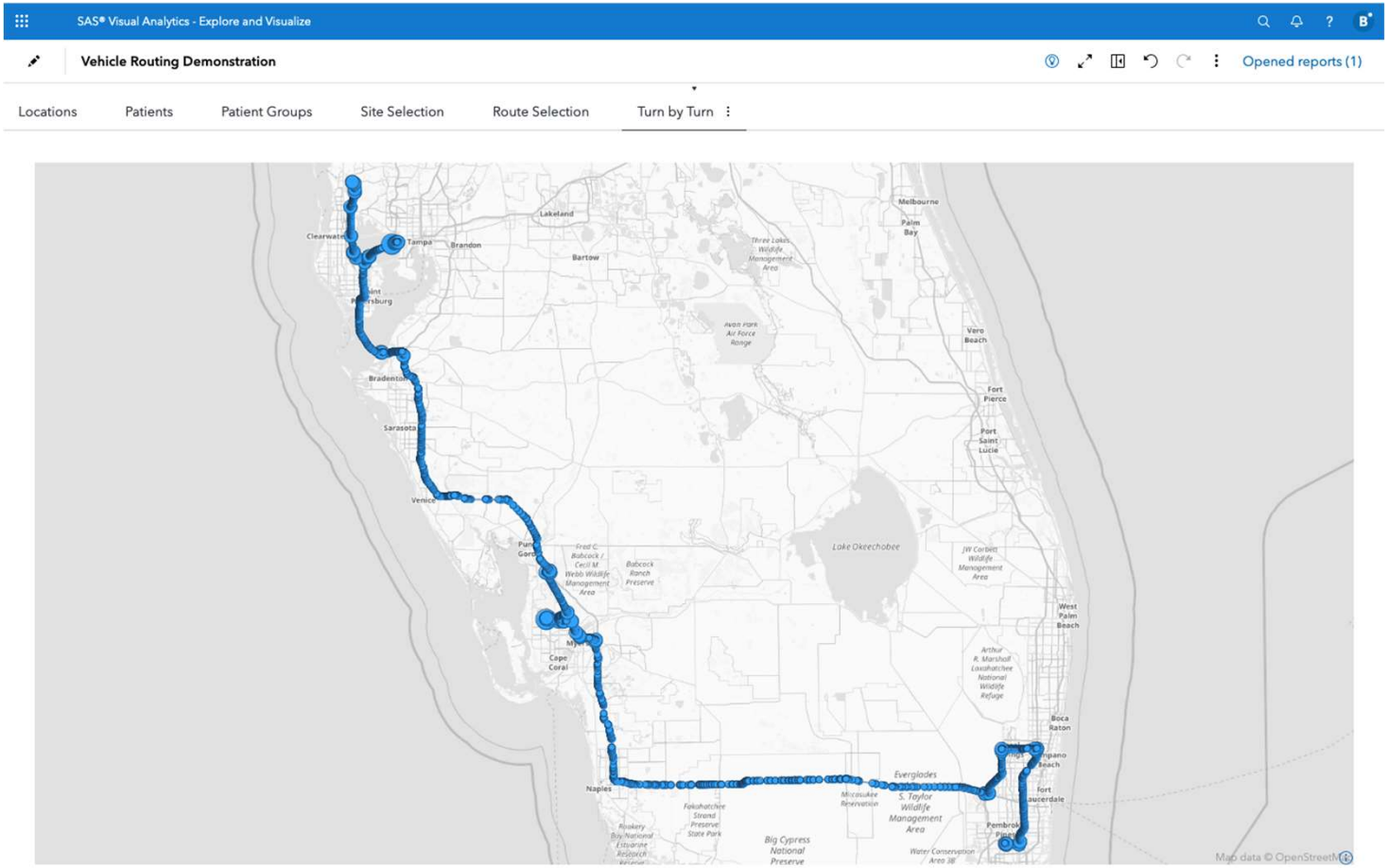












step ▲	modifer	name	type	distance	duration
0	right	56th Place	depart	1122.5	161.5
13	slight left	Monore Circle	new name	7200.7	1064.7
14	right	Monroe Circle	turn	1526	224